MODIS Quarterly Report
Snow and Ice Project
Reporting Period: January - March 1996
Submitted by: Dorothy K. Hall/974

SUMMARY

During this reporting period, work has focused on preparation for and delivering software to the SDST. Version 1 specifications for MODIS snow data products were submitted to the SDST. The Validation Plan for the snow and ice project was written and incorporated into the MODIS Land Group Validation Plan. Research continued on the passive microwave data set collected from the April 1995 flights in Alaska. We are still waiting for the MODIS Airborne Simulator data that were collected during the April '95 mission. An EOS educational video was completed and distributed. Collaborative work with Doug Machoney from Alan Strahler's MODIS project, and Ron Welch from the ASTER team continued. Additionally, 6 papers have either been prepared, or are in preparation for upcoming scientific meetings (IGARSS and the Eastern Snow Conference), and for the special issue on BOREAS results for JGR.

SOFTWARE DELIVERY

Version 1 (V1) data product specifications for all product levels and coding of those specifications in the MODIS snow and ice algorithms were the major algorithm-development activities. V1 specifications for MODIS snow data products (MOD10, MOD10A, MOD10G, MOD33, and ice products MOD29, MOD29G and MOD42) were submitted to the MODIS SDST. The specifications included metadata, required and product-specific metadata, and quality-assurance metadata.

Summary statistics for the products, e.g. area of snow cover in km^2, were defined and specified as product-specific metadata. These summary statistics were integrated into the programs and data products.

Increased error and exception handling capabilities were integrated into the algorithm programs. Program codes were revised to make them compliant with project-required coding standards. Range and error checking functions for data were integrated into the programs. The structure of the programs was revised to enhance execution efficiency of code.

Code writing and delivery was done by George Riggs/RDC and Hugh Powell/GSC.

APRIL 1995 ALASKA MISSION

Work is ongoing in analysis of the Millimeter-wave Imaging Radiometer (MIR) data collected during April 1995 over snow and sea ice in and near Alaska. The mission began one year ago and we still do have have the MODIS Airborne Simulator (MAS) data that were also collected during that mission, due to various problems related primarily to the MAS calibration.

MIR data at 89-, 150- and 220 GHz show patterns that are related to snowmelt in central Alaska, and snow conditions and vegetation patterns in central and northern Alaska. The data clearly show that one cannot interpret passive-microwave data and infer snow depth in Alaska or elsewhere unless the vegetation is taken into account. A paper for the IGARSS '96 symposium was prepared on this topic (see Appendix I).

Additionally, MIR data from the Alaska '95 mission has begun to be analyzed for the sea ice portions of the mission. Preliminary results show that the radiometric brightness temperature over ice-free ocean increases with frequency, but over sea ice, brightness temperature increases with frequency sometimes, but not always. Perhaps when snow is present on the sea ice, surface scattering causes lower brightness temperatures at higher frequencies. A paper for the IGARSS '96 symposium was prepared on this topic (see Appendix II).

Educational Video

An EOS educational video entitled, "Glacier Bay, Alaska, from the Ground, Air and Space," was completed. This 13-minute long, narrated video was done as a collaborative effort between Goddard's Scientific Visualization Studio (SVS) and the Hydrological Sciences Branch/Code 974. The video is being shown widely, including on Montgomery County and Howard County School Systems Cable T.V. It is also being used for educational purposes in Alaska, and is being considered for inclusion in the high school curriculum in all Alaska high schools, as part of their Earth Science curriculum - glacier unit. Copies are available from D. Hall/974.

Collaborative Work with other EOS Investigators

Work has continued in the joint analysis of selected TM scenes using the algorithm developed by the ASTER team and the SNOMAP algorithm to map snow and ice cover. This is a collaborative effort with Dr. Ron Welch/South Dakota School of Mines and Technology, of the ASTER team. A paper is in preparation for the Eastern Snow Conference.

Collaboration with Dr. Doug Machoney of Boston University from Dr. Alan Strahler's MODIS project was begun. Machoney is running a neural net classification on one of our Glacier National Park TM scenes (14 March 1991). When this is completed, we will

compare our results from SNOMAP with his results as part of our efforts to validate our algorithm.

PUBLICATIONS, MEETINGS AND CONFERENCES

The following papers have been prepared for the IGARSS '96 Symposium, 27-31 May 1996, Lincoln, NE:

1) Hall, D.K., J.L. Foster, A.T.C. Chang, D.J. Cavalieri and J.R. Wang, "Analysis of snow cover in Alaska using aircraft microwave data (April 1995)." Appendix I

2) Cavalieri, D.J., D.K. Hall and J.R. Wang, "Comparison of aircraft and DMSP SSM/I passive microwave measurements over the Bering Sea in April 1995." Appendix II

3) Riggs, G.A., D.K. Hall and V.V. Salomonson, "Recent progress in development of the moderate resolution imaging spectroradiometer snow cover algorithm and product." Appendix III.

The following papers are in preparation for the Eastern Snow Conference to be held 1-3 May 1996 in Williamsburg, VA:

4) Riggs, G.A., D.K. Hall and R. Welch, "A comparative look at two algorithms for snow from Earth Observation System instruments." Appendix IV

5) Chang, A.T.C., J.L. Foster and D.K. Hall, "Effects of forest on the snow parameters derived from microwave measurements during the BOREAS winter field campaign."

The following paper is in preparation for a special issue of JGR on BOREAS results:

6) Hall, D.K., J.L. Foster, A.T.C. Chang, K.S. Brown and G.A. Riggs, "Mapping snow cover through forests during the BOREAS winter experiment (February 1994)."